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REMARKS

The present invention is directed to an electron optical lens column and a method of manufacturing the same. As can be appreciated, electron optical lens columns are known and as demands have increased for their accuracy and use, there has been a requirement to provide a highly precise, compact and economically manufactured electron optical lens system. The issue of manufacturing an economical product has been difficult to achieve since tolerances in both placement and dimensions have increased.

The present invention provides a unique column unit that is formed from a respective outer column and an inner column that can be interconnected with appropriate electrical interconnections with via holes to enable electrode parts of respective electron optical lens members to be provided with common or individual potentials. As a result, the combined lens column unit can be formed in a compact manner with a high degree of freedom in depositing electrical interconnections and forming the appropriate electrodes for providing the desired electric fields in focusing and accelerating the electrons.

In manufacturing this improved electron optical lens column, it is possible to coat electrical conductive material in an inner surface of a column unit and then to remove portions of the electrical conductive material in order to create individual electrostatic lenses such as astigmatism corrector lenses, deflector lenses, and object lenses. A ceramic material with a high resistance electrical conductivity can be utilized to properly balance any electrical charge that may accumulate. Thus, a desired level of electrical charge leakage is provided to prevent any unwanted charge buildup while still maintaining sufficient resistivity to prevent current leakage between the individual electrode parts.

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The Office Action contended that *Takamitsu et al* (Japanese Laid-Open Patent 06-187901) disclosed a column unit for an electron optical lens with an inner surface of the column having a high resistance electrical conductivity. The Office Action further rejected Claims 3-5 as being obvious over the *Takamitsu et al* reference, and contended that a specific range of high resistance would simply be obvious to a person of ordinary skill at the time of the invention.

As can be seen at Page 3, Paragraph 0017, the *Takamitsu et al* reference employed a metal membrane of a high resistance film of SiC with a range between $10^3 \times 10^5 \Omega\text{-cm}$. The actual insulating barrel was formed from aluminum nitride and a resistance film was provided by a CVC deposition technique. It is clear that a provision of a purported smooth distributional potential along the axis of the cylinder to reduce aberrations of the electrostatic lens was important in this design.

As noted in Paragraph 24, the electrostatic lens was attained by "covering a metal membrane 13 with a high resistance film 12 to an insulating barrel 11" and accordingly, taught away from preparing an electrode like the electrostatic lenses shown in our drawings.

Given the teachings in *Takamitsu et al* reference, it is respectfully submitted that a person of ordinary skill in the field would not attempt to manufacture such a product from a single material, nor select a much higher resistivity range, since an optimum working range should be within the specific teaching of 10^3 to $10^5 \Omega\text{-cm}$. As set forth in MPEP §706.02(a), when an applicant traverses an assertion of matters of common knowledge, the Patent Office should cite a reference in support of such a position.

The Office Action further rejected Claims 1-2, 6-9, 11-15, 19-20 and 22 as being anticipated by the *Sato et al* (U.S. Patent No. 5,719,402) purportedly for teaching a feature of combining an inner column and an outer column to form an electron optical lens.

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Satoh et al teaches a system for exposing a semiconductor wafer to a charged particle beam. The Office Action cited purportedly Figure 6A and 6B to teach an inner column and an outer column. Figure 6A discloses an electrostatic deflector wherein conductive material is applied to the inner surface of a cylinder member 301 "which is formed in one piece by injection." See Column 3, Lines 25-26. As can be seen, Figure 6B is a cross-sectional view that affirms that only a single column unit is provided, not an inner column and an outer column.

The embodiment referred to in Figure 43 was described on Column 36, Lines 44-55. As can be seen, the only difference from the embodiment of Figure 6A is that electrode ends extend from both ends of the cylinder as opposed to the view in Figure 6A that had the electrode ends only extending from one end. Again, there are no inner columns and outer columns that are provided to facilitate a relatively inexpensive construction while providing a capability of depositing electrical interconnections on appropriate complimentary surfaces.

Applicant has reviewed each cited column numbers and lines cited on Page 3 of the Office Action, but has been unable to determine any relevance to our claims directed to a ceramic material of a high resistance of electrical conductivity within a specified range, or any teaching to balance leakage of current in the environment of electron optical lens column.

The provision of an inner column and an outer column to provide an ease in manufacturing and to facilitate electrical interconnections, is neither recognized nor taught in the cited portions of the specification, nor in fact in the remaining portions of the specification.

Basically, a person of ordinary skill in the field would quickly appreciate that the *Satoh et al.* invention is directed to a method and a disclosure of driving circuitry that permitted adjustment for astigmatism in a deflection of the charged particle beam, not only with a first electrostatic deflector, but a second electrostatic deflector arranged in series.

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Claims 1, 16 and 17 were held to be anticipated by the *Nakasugi* (U.S. Patent No. 6,125,522), while Claim 29 was held to be obvious over the *Nakasugi* reference.

The *Nakasugi* reference was of interest in disclosing a method of manufacturing an electrostatic deflector with multiple electrodes. A jig member 1 as shown in Figure 1 was utilized for the manufacturing of the individual electrode members. The jig was subsequently removed, for example, by being dissolved in an acid bath. See Column 6, Lines 13-26.

The final configuration for the product is shown in Figure 4 with an outer casing 4 capable of securing the individual electrode members through screws 3A-3H. As can be readily appreciated, individual segments of electrodes were formed and aligned with the jig and then the eight individual electrodes in a roughly truncated shape, shown in Figure 2, was then secured by screws to a supporting frame 4.

The individual electrode members were formed from a ceramic material which were then coated with a titanium and platinum film by a sputtering technique. See Column 4, Lines 17-19. This conductive material is applied to the entire surface of the electrode members except the outer curved surfaces, which will bear threaded holds for connection with the outer casing. The conductive coating serves the function of an "antistatic conductive coating." See Column 4, Line 62. Since the individual electrode members are spaced and the conductive coating is not on the back surface, they are, therefore, electrically insulated from adjacent electrodes.

As can be readily appreciated, there is no teaching of an inner column and an outer column, as shown for example in Figure 2 of our present invention. Additionally, the ceramic material does not have a balanced high resistance electrical conductivity on an inner surface. As shown in Figure 4, electrical lead wires 6A-6H are spot welded to the ends of the electrode

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members. There is no teaching of electrical interconnections between respective columns, as defined in our present claims.

The *Ooah et al* (U.S. Patent No. 6,055,719) was cited as anticipating respectively Claims 1 and 21 while rendering obvious Claim 30.

The Office Action contended, without the citation of any teaching reference, that because an elongated member with an opening extending therethrough was disclosed in the *Ooah et al* reference that purportedly dissipate a charge buildup, that it would be obvious to form the structure of the *Ooah et al* reference with a material to provide a leakage current. That is, grooves taught a specific material selection.

Again, applicant respectfully traverses this unsupported assertion and requests that a reference be cited to support such a contention, since it is respectfully submitted that such an approach could only be taken in hindsight of the teachings of the present application, since there certainly is no teaching in the cited reference.

"When prior art references require selective combination by the court to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gleaned from the invention itself."

Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 1143 (Fed. Cir. 1985).

Additionally, the Office Action contended that while the *Ooah et al* reference taught a electrostatic deflector designed to be mounted within a vacuum and isolated from eddy currents generated from the application of an electric field from an external electromagnetic deflector.

The teaching of *Ooah et al* to resolve a problem of eddy currents was to provide plurality of pairs of electrodes made of conductive materials having carbon as a primary element. The electrodes are isolated and embedded in the face of an insulating cylinder. *Ooah et al*

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teaches that a relatively higher resistance of carbon can help eliminate the occurrences of eddy current resulting from changes in the magnetic field. Further, *Ooah et al* teaches separation grooves formed between each of the plurality of pairs of electrodes, purportedly for alignment and a purpose of dissipating charges from the influence of an electric field.

Given this teaching, the assertions of the Office Action that selecting a ceramic material of a high resistance electrical conductivity, would be obvious to a person of skill in the field, is lacking any support or foundation. *Ooah et al* teaches use of a highly conductive carbon to form the substrate of the electrodes, not a ceramic material that has been balanced within a range of high resistivity to permit sufficient leakage current while maintaining optimum conditions for producing electric fields for a plurality of stacked electrostatic lenses.

In summary, the *Takamitsu et al* reference taught a manufacturing method of etching a high resistance film on an inside surface of a column unit, and then to coat the etch portion with a metallic film of aluminum by a sputtering deposition.

This can be compared with the manufacturing method of our present invention, where we coat an electrical conductive material on the inner surface of a column unit and we structure an electrostatic lens by removal of a portion of the electroconductive material, thereby leaving a high resistance surface that is not coated.

Further in our manufacturing method, we insert an outer column around an inner column while aligning electrical interconnections. The *Sato et al* reference fails to teach an inner column and an outer column collectively combined to provide a uniting electron optical lens column. Our present invention utilizes an inner column and an outer column with electrical interconnections that can be deposited on the respective surface of the inner and outer columns.

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This permits the lens column to be manufactured conveniently with a subjective determination of the positions of the electrical interconnections with a lens column having a very compact size.

The *Nakasuji et al* reference does not comprise an inner column and an outer column, but rather utilizes a disposable jig for positioning and forming electrodes that are then required to be screwed and fixed to the inside surface of an outer casing, with screws.

Finally, the *Ooah et al* reference employs a conductive carbon based material with separation grooves as shown, for example, in the cross section of Figure 7. It certainly does not teach a high resistance electrical conductivity arrangement, nor electrical connections between an inner and outer column, as defined in our present claims.

In view of the amendment to the claims and the above comments, it is respectfully submitted the case is now in condition for allowance and early notification of the same is requested.

If the Examiner believes that a telephone interview will help further the prosecution of this case, he is respectfully requested to contact the undersigned attorney at the listed telephone number.

I hereby certify that this correspondence is being transmitted via facsimile to the USPTO at 571-273-8300 on June 22, 2006.

Very truly yours,

SNELL & WILMER L.L.P.

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Signature

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